



A comparison of a battery-operated power toothbrush and a manual toothbrush with respect to safety and plaque removal

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OBJECTIVES

To compare the safety and plaque removal efficacy of the Braun Oral-B Battery Toothbrush (D4) and a standard flat trim ADA adult manual toothbrush.

DESIGN

This was a single-blind, single-use, randomized, split-mouth study.

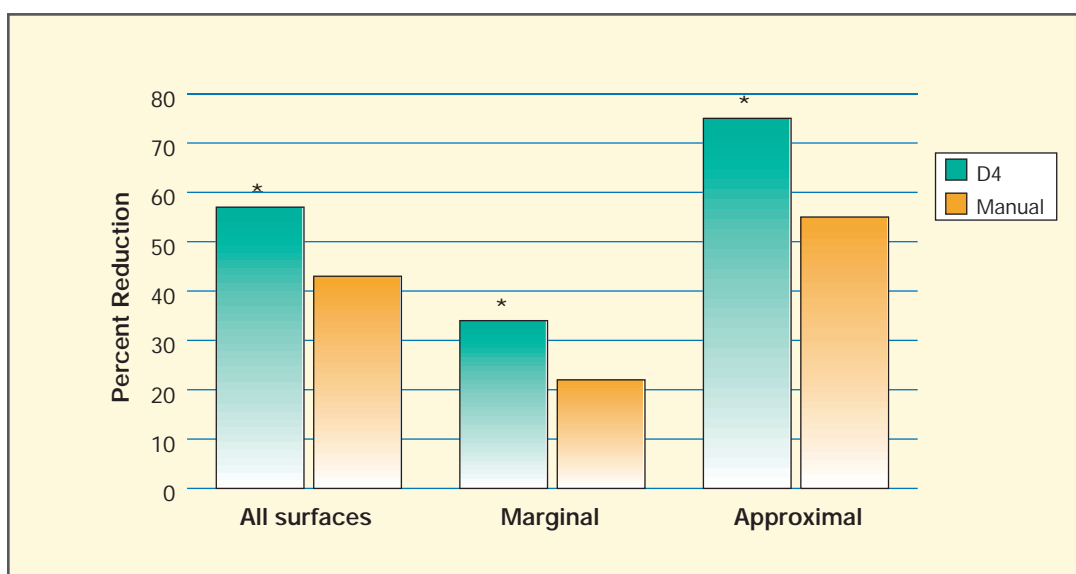
MATERIALS AND METHODS

A total of 48 healthy subjects with a mean age of 34.1 years were recruited into the trial from a general population. At an initial visit, subjects who complied with the inclusion and exclusion criteria received a baseline oral hard and soft tissue examination and a full mouth prophylaxis. They were then given written and verbal instructions in the use of the battery-operated D4 power toothbrush, after which they demonstrated their competence in using the brush prior to leaving the test facility. Subjects were requested to brush their teeth at home for 60 seconds twice a day until returning for the clinical assessment phase of the study approximately 7 days later.

At the second visit, after abstaining from any form of oral hygiene for 23–25 hours, subjects brushed two randomly assigned quadrants of the mouth (Q1 and Q3 or Q2 and Q4) with either the D4 or the manual toothbrush and the remaining two quadrants with the second brush for a total of 15 seconds per quadrant. Examination of oral hard and soft tissues and measurement of plaque were made before and after brushing. Plaque was evaluated, after disclosing the teeth, according to the Rustogi modification of the Navy Plaque Index. This index allowed an accurate assessment of plaque on the gingival margin and approximal surfaces. Changes from pre- to post-brushing for each toothbrush were analyzed by means of a paired *t*-test.

RESULTS

Percentage reduction in plaque after brushing for 15 seconds per quadrant



* Statistically significant difference, $p < 0.0001$

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Both toothbrushes were found to be safe as used in the study. There were no adverse events reported and there was no evidence of hard or soft tissue abrasion with either toothbrush over the 7 days of home use or after the single-use phase of the study.

Plaque reductions achieved in all areas from pre- to post-brushing with both toothbrushes were statistically significant ($p < 0.0001$). A comparison of the efficacy of the two toothbrushes demonstrated that the D4 was significantly more effective than the ADA manual toothbrush for all surfaces ($p < 0.0001$). For all surfaces the D4 was 14% more effective than the manual toothbrush, while at marginal surfaces the difference was 12% and at approximal surfaces 19%.

Analysis of plaque removal from buccal and lingual surfaces revealed that for both these surfaces plaque reductions with both toothbrushes were statistically significant ($p < 0.0001$). At both buccal and lingual surfaces the D4 removed a significantly greater amount of plaque than the manual toothbrush ($p < 0.0001$), and with both toothbrushes, plaque removal efficacy was greater at buccal sites than lingual sites. The D4 removed 65% of plaque from buccal sites compared with 48% from lingual sites. Figures for the manual toothbrush were 55% and 19%, respectively.

CLINICAL COMMENT

Regular toothbrushing represents an effective method of home oral hygiene and, if performed well and for sufficient duration, plaque can be maintained at a level that will ensure gingival health. Unfortunately, it is known that the majority of the general public do not brush for the recommended time of 2 minutes twice per day and brushing technique is likely to be less than ideal. Some power toothbrushes remove significantly more plaque than a manual brush and can help to overcome the limitations associated with using a manual brush. The introduction of low-cost, battery-operated power toothbrushes means that a power toothbrush is now much more likely to be purchased by the general public, but not all the currently available devices offer any real advantage over a manual toothbrush. This study, which compared the Braun Oral-B Battery Toothbrush (D4) with a flat trim manual toothbrush, demonstrated that the Braun Oral-B toothbrush is significantly more effective than an ordinary manual toothbrush and therefore a useful device for home oral hygiene that should help to improve gingival health.